Monitoring of a Norwegian steel-concrete bridge strengthening for composite action

Victor Vestman & Peter Collin

Ramboll Sweden AB, Luleå / Luleå University of Technology, Sweden

Robert Hällmark

Swedish Transport Administration, Luleå / LTU, Sweden

Magnús Arason

EFLA Consulting Engineers, Reykjavik, Iceland

Contact: victor.vestman@ltu.se

Abstract

Traffic density and vehicle weight have been increasing over time, which implies that many existing road bridges were not designed for the high service loads and the increased number of load cycles that they are exposed to today. One way to increase the traffic load capacity of non-composite steel-concrete bridges is to use post-install shear connectors and one type of shear connector is the coiled spring pin. This type of connector has advantages for strengthening of existing bridges, since it enables an installation from below while the bridge is still in service and does not bring along removal of concrete and pavement, nor welding to the top flange.

This paper describes one ~50 years old Norwegian single span steel-concrete bridge that was strengthened with post-installed coiled spring pins. The strengthening method and the design procedure are presented, along with the results from a field monitoring on Sagstu bridge, performed to evaluate the behaviour of the strengthened structure. The results show that the coiled spring pins counteract the slip and bring along a very good degree of composite action.

Keywords: composite bridges, coiled spring pins, monitoring, post-installed shear connectors.

1 Introduction

Since traffic loads all around the globe are getting heavier, the demands on the existing bridges bearing capacity in the public transportation system are at the limit. In Norway the specified demands for capacity of old bridges are today that allowing a standard passage with a 60 tons timber lorry and a passages of a 100 tons special vehicle. The usage criteria for bridges that have about 50 years or less of the 100-year design life remaining are defined as Bk10/60 and Sv12/100 in the directives of the Norwegian Public Road Administration (HB R412) [1].

Many old bridges need strengthening are steel girders with a concrete deck without any intended composite action between the construction parts. In the Norwegian road network, there are over 1700 steel girder bridges with a concrete deck

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